MULTIMEDIA UNIVERSITY

STUDENT ID NO

MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2015/2016

BMM 1014 – MATHEMATICS FOR MANAGERS

(All Sections / Groups)

3 JUNE 2016
9.00 a.m - 11.00 a.m
(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of 7 pages with 5 questions only.
2. Attempt any **FOUR** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the Answer Booklet provided.
4. Formulae are attached at the end of the question paper.

QUESTION 1

(a) Nova Sdn Bhd, a laptop manufacturer, has a monthly fixed cost of RM450, 000 and a production cost of RM1300 for each laptop manufactured. The laptops sell for RM1859 each.

(i) Find the monthly break-even quantity of Nova Sdn Bhd. (3 marks)

(ii) Find the profit or loss of the company if the company manages to sell 2000 laptops? (3 marks)

Now suppose that the increased in material cost has raised the variable cost to RM1450 per laptop and fixed cost increase to RM480, 000.

(iii) Find the new break-even level of the company (3 marks)

(iv) If the company expects to be able to sell 10,000 laptops, what price should be charged in order to break even? (3 marks)

(b) A furniture factory manufactures three models of cabinets, models A, B, and C. Each model A cabinet requires 10 hours of cutting, 1 hour of assembly, and 1 hour of finishing. Each model B cabinet requires 2 hours of cutting, 9 hours of assembly, and 1 hour of finishing. Each model C cabinet requires 2 hours of cutting, 3 hours of assembly, and 5 hours of finishing. There are 2820 hours available each week in the cutting department, 1610 hours in the finishing department, and 2390 hours in the assembly department. How many cabinets of each model should be manufactured each week if all available time is used?

(13 marks)

(Total: 25 marks)

Continued...

QUESTION 2

A gardener mixed two brands of chemical compound in order to make the plant grow well. Brand P cost RM 190 per kg while brand Q costs RM 170 per kg. Each kg of brand P contains 40 units of nutritional element A, 120 units of element B and 40 units of element C. Each kg of brand Q contains 20 units of nutritional element A, 40 units of element B and 45 units of element C. The minimum requirement of nutrients A and C are 600 units and 900 units respectively. The maximum requirement of nutrients B is restricted to 3600 units only. In order to achieve the minimum cost spent on the purchasing of chemical compound, the gardener has decided to purchase at most 50kg chemical compound of brand Q but the gardener needs to purchase not less than 10 kg chemical compound of brand Q due to the agreement with the chemical compound retailer of brand Q.

(a) Formulate the above problem as a Linear Programming problem.

(5 marks)

(b) Graph the above information in part (a) into a suitable diagram and shade the feasible region clearly.

(6 marks)

(c) Advise the gardener on the number of kg of each brand that should be mixed to produce a mixture having a minimum cost per kg.

(11 marks)

(d) What would be the effect on the optimal solution if the market price of the chemical compound of Brand Q has increased from RM 170 to RM 250?

(3 marks)
(Total: 25 marks)

Continued...

QUESTION 3

(a) How long in days for an amount of RM20,000 to earn interest amounted of RM1,618.75 at a simple interest rate of 9% per year? (Assuming 1 year = 365 days)

(4 marks)

(b) Mr. Redfoo won a lottery with an amount of RM15,000. He intends to invest it in a saving account for 9 years. Bank AMT offers him an interest rate of 6.5% compounded quarterly and Bank CPA offers him an interest rate of 5.9% compounded monthly. Which bank should Mr Redfoo invest his money.

(8 marks)

(c) If RM4500 is deposited in a saving account that earns interest at an annual rate of 6.75% compounded continuously, what is the value of the account at the end of eight years?

(4 marks)

(d) Mr. Zouk wishes to save for retirement. He puts RM1750 into an account every quarter for 25 years at 3.75% compounded quarterly. Find

(i) the amount in his retirement account after 25 years.

(5 marks)

(ii) the total amount of interest that Mr. Zouk earned.

(4 marks)
(Total: 25 marks)

Continued...

QUESTION 4

(a) Find the derivative of each function.

(i) $f(x) = \frac{e^{3x}+1}{x}$

(4 marks)

(ii) $f(x) = (x^2 - 5)(x^3 - 2x + 3)$

(2 marks)

(b) The demand equation for a new brand Orange smartphone is given by

$$p = \frac{1}{12}x^2 - 7.5x + 125$$

$0 \leq x \leq 50$. Find the value of x (in unit) and the corresponding price p (in RM) that maximize the revenue.

(7 marks)

(c) Beetle Company has started selling a new type of piano at the price of RM $(420 - 0.6x)$ where x is the number of pianos manufactured per day. The parts for each piano cost RM 60 and the labour and overhead for running the plant cost RM 5555.

(i) Find the revenue function R and the profit function P.

(5 marks)

(ii) Find the marginal cost function, the marginal revenue function, and the marginal profit function.

(3 marks)

(iii) Determine the level of production that maximize the profits. What is the maximum profit?

(4 marks)
(Total: 25 marks)

Continued...

QUESTION 5

(a) Find the indefinite integral $\int 7x^6\sqrt{5-x^7}\,dx$

(5 marks)

(b) As part of a quality-control program, the gift sets manufactured by Johnson Clara Company are subjected to a final inspection before packing. The rate of increase in the number of sets checked per hour by an inspector t hours into the 6 A.M. to 12 noon morning shift is given by

$$N'(t) = -6t^2 + 24t + 8 \qquad (0 \le t \le 6)$$

How many sets does the average inspector check during a morning shift?

(5 marks)

(c) A KL Festival promoter produces two types of wristbands; type A sells for \$19, and type B sells for \$26. The total revenue (in thousands of RM) is given by

$$R(x,y) = 19x + 26y$$

and the total cost (in thousands of RM) of producing these wristbands is given by

$$C(x,y) = 10x^2 - 6xy + 1.5y^2 - 25x + 32y - 20$$

where x denotes thousand wristbands of type A and y denotes thousand wristbands of type B produced and sold. How many of each type of wristbands must be produced and sold in order to maximize profit? What is the maximum profit realizable?

(15 marks)
(Total: 25 marks)

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LIST OF FORMULA

1. Quadratic Formula

The solution of the equation:
$ax^2 + bx + c = 0$,
$a \neq 0$, are $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

2. Simple Interest

Interest, $I = Prt$ (P = principal, r = interest rate, t = number of years)
Accumulated amount, $A = P(1 + rt)$

3. Compound Interest

Accumulated amount, $A = P(1 + i)^n$, where $i = r/m$, and $n = mt$ (m = number of conversion periods per year)

4. Continuous Compound Interest

$A = Pe^{rt}$

5. Effective Rate of Interest

$r_{eff} = (1 + r/m)^m - 1$

6. Present Value for Compound Interest

$P = A(1 + i)^{-n}$

7. Future Value of an Annuity

$$S = R\left[\frac{(1+i)^n - 1}{i}\right]$$

(S = future value of ordinary annuity of n payments of R dollars periodic payment)

8. Present Value of an Annuity

$$P = R\left[\frac{1-(1+i)^{-n}}{i}\right]$$

(P = present value of ordinary annuity of n payments of R dollars periodic payment)

Continued...

9. Amortization Formula

$$R = \left[\frac{Pi}{1-(1+i)^{-n}} \right]$$

(R = periodic payment on a loan of P dollars to be amortized over n periods)

10. Sinking Fund Formula

$$R = \left[\frac{Si}{(1+i)^{n}-1} \right]$$

(R = periodic payment required to accumulate S dollars over n periods)

11. Break-even point = $\frac{\text{Fixed Cost}}{\text{Contribution per unit}}$ (Contribution per unit = unit selling price – unit variable cost)

Sales (unit) = $\frac{\text{Fixed cost + Target profit}}{\text{Contribution per unit}}$

Calculus

12. Product rule

$$f(x) = u(x).v(x)$$

$$f'(x) = u(x).\frac{dv}{dx} + v(x).\frac{du}{dx}$$

13. Quotient rule

$$f(x) = \frac{u(x)}{v(x)}$$

$$f'(x) = \frac{v(x)\frac{du}{dx} - u(x)\frac{dv}{dx}}{[v(x)]^2}$$

End of Paper